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Review paper

Sensitivity and selectivity of electrochemical enzyme sensors for inhibitor determination

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Abstract

The performance of electrochemical biosensors developed for the determination of inhibiting species is considered. The role of various factors affecting the analytical characteristics of biosensors, their selectivity toward inhibitors to be tested as well as operational characteristics is discussed. The choice of enzyme-inhibitor system, the influence of enzyme immobilization on the behaviour of a biosensor, the modes of the optimization of working conditions are discussed. Most conclusions are illustrated with the models of the application of biosensors for monitoring environmental pollutants.

Keywords: Sensitivity; Selectivity; Electrochemical; Enzyme sensors; Inhibitor determination

1. Introduction

The development of biosensors is most promising in the progress of analysis of biologically active compounds. In the past two decades biosensors had emerged from laboratories and in some cases became conventional devices for routine analysis [1–3] owing to the advantages biosensors possess, such as simple measurement procedure, short response time, sufficient sensitivity and selectivity. This refers to the analysis of glucose, urea, lactate, cholesterol and of several medications [4–8]. Traditional monitoring methods are often slower and call for expensive equipment which makes them unsuitable for real time control. This makes biosensors more attractive, especially for unqualified users and for field applications.

The commercial production of biosensors is associated with the biomedical analysis of a limited number of metabolites and pharmaceuticals [2–4]. As substrates of appropriate enzymes they can be determined directly in biological fluids with detection limits down to 10^{-6}–10^{-7} mol l^{-1}. This is more than sufficient for most practical purposes. Substrate biosensors are often considered to be reagentless methods of analysis. Such

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